

CLAIMS

The invention claimed is:

1. A method of selecting an intensity threshold for image halftoning comprising
5 the steps of:
 - (a) selecting a first intensity threshold if an error of at least one a
 current pixel and a neighboring pixel exceeds a first error
 threshold;
 - (b) selecting a second intensity threshold if an error of a pixel
10 remotely neighboring said current pixel exceeds a second error
 threshold and said first intensity threshold is not selected; and
 - (c) selecting a third intensity threshold if at least one of said first
 and said second intensity thresholds is not selected.
- 15 2. The method of claim 1 wherein at least one of said first and said second error
 thresholds is substantially zero error.
3. The method of claim 1 wherein an intensity of said first intensity threshold is
 greater than an intensity of said second intensity threshold and said intensity
20 of said second intensity threshold is greater than an intensity of said third
 threshold.
4. The method of claim 1 wherein at least one of said error of said first pixel, said
 neighboring pixel, and said remote neighboring pixel comprises a component
25 color error for said pixel.
5. A halftone image display method comprising the steps of:
 - (a) determining an intensity of a current pixel in an image;

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- (b) augmenting said intensity of said current pixel with a current pixel error;
 - (c) selecting a first intensity threshold if at least one of said current pixel error and a neighboring pixel error is less than an error threshold and otherwise selecting a second intensity threshold;
 - (d) displaying said current pixel with one of a first displayed intensity if said augmented intensity of said current pixel exceeds said selected intensity threshold and otherwise displaying said current pixel with a second displayed intensity;
 - 10 and
 - (e) assigning an error between said displayed intensity and said augmented intensity of said current pixel to at least one pixel neighboring said current pixel.

15 6. The method of claim 5 wherein said error threshold is substantially zero error.

7. The method of claim 5 wherein said first displayed intensity comprises a maximum intensity and said second displayed intensity comprises a minimum intensity.

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8. The method of claim 5 wherein said intensity of said current pixel comprises an intensity of a color component of said pixel.

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9. The method of claim 5 wherein an intensity of said first intensity threshold is greater than an intensity of said second intensity threshold.

10. The method of claim 5 further comprising the step of displaying said current pixel with said first displayed intensity if said augmented intensity of said current pixel exceeds a third intensity threshold, an intensity of said third

intensity threshold being greater than an intensity of said first intensity threshold.

11. The method of claim 5 wherein at least one of said current pixel error and
5 said neighboring pixel error comprises a component color error.

12. An error diffusion halftone image display method comprising the steps of:

10 (a) determining an intensity of a current pixel in an image;

(b) augmenting said intensity of said current pixel with a current
pixel error;

(c) selecting a first intensity threshold if at least one of said current
pixel error and an immediate neighboring pixel error is less than
a first error threshold;

15 (d) selecting a second intensity threshold if a remote neighboring
pixel error is less than a second error threshold and said first
error threshold is not selected;

(e) selecting a third intensity threshold if a more remote neighboring
pixel error is less than a third error threshold and one of said
first and said second error thresholds is not selected;

20 (f) selecting a fourth intensity threshold if one of said first, said
second, and said third intensity thresholds is not selected;

(g) displaying said current pixel with one of a first displayed intensity
if said augmented intensity of said current pixel exceeds said
selected intensity threshold and otherwise displaying said
25 current pixel with a second displayed intensity; and

(h) assigning an error between said displayed intensity and said
augmented intensity of said current pixel to at least one pixel
neighboring said current pixel.

13. The method of claim 12 wherein at least one of said first, said second, and said third error thresholds is substantially zero error.
14. The method of claim 12 wherein said first displayed intensity comprises a maximum intensity and said second displayed intensity comprises a minimum intensity for said pixel.
15. The method of claim 12 wherein said intensity of said current pixel comprises an intensity of a color component of said pixel.
16. The method of claim 12 wherein an intensity of said first intensity threshold is greater than an intensity of said second intensity threshold, said intensity of said second intensity threshold is greater than an intensity of said third intensity threshold, and said intensity of said third intensity threshold is greater than an intensity of said fourth intensity threshold.
17. The method of claim 12 further comprising the step of displaying said current pixel with a maximum displayed intensity if said augmented intensity of said current pixel exceeds a fifth intensity threshold, an intensity of said fifth intensity threshold being greater than an intensity of said first intensity threshold.
18. The method of claim 12 wherein at least one of said current pixel error, said neighboring pixel error, and said remote neighboring pixel error comprises a component color error.
19. The method of claim 18 wherein said component color error comprises an error for a component color other than the component color of the current pixel.

20. A halftoning encoder comprising:

- (a) a selected thresholding unit comparing an input intensity of a current pixel to a selected threshold intensity; and
- (b) a threshold selection unit selecting one of a plurality of threshold intensities for said selected threshold unit in response to an error for at least one of said current pixel and a pixel neighboring said current pixel.

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21. The apparatus of claim 20 further comprising an initial thresholding unit comparing said input intensity of said current pixel to an initial threshold intensity, said initial threshold being greater than said selected threshold intensity.

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22. The apparatus of claim 20 further comprising:

- (a) an error filter distributing an error produced by printing said current pixel to a plurality of pixels neighboring said current pixel; and
- (b) an error buffer accumulating said distributed error for a pixel.

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